BBPI

THE

ONTARIO WATER RESOURCES

COMMISSION

WELL AND WATER POLLUTION SURVEY

of the

VILLAGE OF BLOOMFIELD

COUNTY OF PRINCE EDWARD

1971

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THE

ONTARIO WATER RESOURCES COMMISSION

REPORT ON A

WELL AND WATER POLLUTION SURVEY

OF THE

VILLAGE OF BLOOMFIELD

IN THE

COUNTY OF PRINCE EDWARD

DIVISION OF SANITARY ENGINEERING

DISTRICT ENGINEERS BRANCH

1971

REPORT ON A

WELL AND WATER POLLUTION SURVEY

OF THE

VILLAGE OF BLOOMFIELD

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REPORT ON A
WELL AND WATER POLLUTION SURVEY
OF THE
VILLAGE OF BLOOMFIELD

INTRODUCTION

With the assistance of the Hastings and Prince Edward Counties Health Unit, staff of the District Engineers Branch, Ontario Water Resources Commission conducted a well survey in the Village of Bloomfield on April 13, 1971. After locating and recording the wells that were unsatisfactory, emphasis was placed on evaluating the causes of the pollution and the practices which might be taken to avert or alleviate the problem.

To fully complete the investigation it was necessary to study th watercourse flowing through the village and at the same time locate sources of existing or potential sources of pollution. The information gathered was certainly sufficient to justify the recommendations presented in this report.

INTERVIEWS WITH OFFICIALS

The comments, ideas, assistance and information from the following during the survey was deeply appreciated:

Mr. A. Anderson, Reeve

Mr. C. Fraleigh, Village Clerk

Mr. A. Seeley, Public Health Inspector

BRIEF HISTORY AND LOCATION

The Village of Bloomfield, incorporated as a village in 1906, is located five miles west of the Town of Picton and six miles east of the Village of Wellington. The predominant

agricultural nature of the area surrounding Bloomfield has influenced the type of industry locating there. In addition, there are many retired farmers living on fixed incomes within the village limits.

TOPOGRAPHY AND SOIL CONDITIONS

Topography in the area ranges from undulating to slightly rolling.

Generally, the external and internal drainage of the soil is good. Surface drainage is facilitated by a small creek flowing in a south westerly direction to West Lake. The creek is permanent, but does not carry much water.

Occasionally, bedrock occurs within five feet of the surface but for the most part it is greater than this depth. Records maintained by the OWRC, Division of Water Resources, on the wells drilled in the area reveal that the depth of soil to bedrock usually varies between 20 and 30 feet.

POPULATION, PROPOSED GROWTH AND INDUSTRY

According to the 1971 Municipal Directory, the population of the Village of Bloomfield is 711. Although the population has remained nearly constant and has actually declined over the last several years, the rapid movement of people to recreational areas may cause new development to take place. Therefore, it may be assumed that in 20 years the population will be about 1000.

Baxter Canning Co. Ltd., the largest wet industry within the village limits, operates the year round and relies on spray irrigation for treatment of wastes. Other industries include a

sawmill and a creamery which distribute milk products.

EXISTING SERVICES AND GROUNDWATER CONDITIONS

The residents depend solely on individual water supplies and individual sewage disposal systems.

The capacity of the wells vary greatly within the village but normally the demands of the residents are met even during the critical times of the year. In fact, several wells have been rated at 80 gpm by the well drillers. Baxter Canning Co. Ltd. using about 100,000 gpd obtain their water from a very productive drilled well.

Conditions of the groundwater supply in the Bloomfield, Wellington area were summarized in an OWRC report dated March 1959. At that time it was stated that wells one mile south of the Village of Bloomfield could probably be found to produce 50 gpm.

WELL SURVEY

INTRODUCTION

An attempt was made to secure a bacteriological sample from each well in the village, however, as could be expected many of the residents were not at home. Staff did note that it was abnormal to find so many especially when the public were made aware of the survey beforehand. Throughout the survey several residents also refused to allow their wells to be sampled while at the same time pointing out their objection to a municipal system.

Chemical samples were collected at random from a statistically representative number of wells and analysed for hardness, alkalinity, iron, chlorides, pH, total nitrogen, total phosphorus and sulphate.

The bacteriological samples were analysed at the Ontario Department of Health Laboratory in Kingston while the chemical samples were analysed by the Ontario Water Resources Commission Laboratory at Highway 401 and Islington, Toronto. All analyses were conducted according to "Standard Methods".

BACTERIOLOGICAL RESULTS

In Table 1 a summary of the well survey is presented:

TABLE 1

SUMMARY OF WELL SURVEY IN THE VILLAGE OF BLOOMFIELD

Number of Wells Sampled	111
Number of Drilled Wells	85 (77%)
Number of Dug Wells	24 (22%)
Other	2 (1%)
* Samples Satisfactory	66 (59%)
** Samples Doubtful	21 (19%)
*** Samples Unsatisfactory	24 (22%)

* Satisfactory (total coliform organisms - 0)
(fecal coliform organisms - 0)

** Doubtful (Total coliform organisms - Present)
(fecal coliform organisms - 0)

*** Unsatisfactory (Total coliform bacteria - Present)
(fecal coliform bacteria - Present)

The presence of coliform bacteria without fecal bacteria (doubtful) suggests the possibility of a fairly remote stage of pollution and though not constituting of itself conclusive evidence

of danger is nevertheless sufficient to indicate that the water may be harmful. The presence of fecal bacteria,which normally do not multiply in natural sites outside the intestines of warm blooded animals, can be regarded as almost undoubted evidence of recent excretal pollution. For this reason the presence of fecal bacteria in domestic water supplies is regarded as being severe enough to render the water potentially dangerous and should not be consummed unless treated.

Every resident who had his well sampled and the results indicated the presence of fecal and/or total coliforms was sent a letter, a copy of which is appended to the report. In this letter suggestions were presented outlining measures that should be taken to perhaps restore the well to a working condition.

Owing to the great number of premises visited, the compilation of all the data on each well will not be presented. If however this information is requested it can be readily made available to council.

CHEMICAL RESULTS

Chemical samples were collected from five drilled wells and one dug well ranging in depth between 30 and 80 feet.

The following mineral constituents include all that are commonly found in natural waters in quantities sufficient to have any practical effect on the value of the waters for domestic use.

Hardness ($CaCO_3$) - is attributable principally to calcium and magnesium compounds and refers to the amount of soap that first must be used to precipitate the above compounds before a lather is produced. Hardness in the Bloomfield area is probably caused by the natural accumulations of salts from contact within the limestone formations. The detrimental effects of hardness include excessive soap consumption, formation of scums and scales, and the toughening of vegetables. All the wells sampled indicate the water is very hard.

Alkalinity ($CaCO_3$)- is not a polluting substance or considered to be harmful to humans but it is associated with high pH values, hardness and excessive dissolved solids, all of which may be deleterious. The average alkalinity concentration of the six wells sampled was 272 ppm.

Iron (Fe) - can be dissolved in combination from many rocks, from well casings, water pipes, and other fixtures. The OWRC recommend a limit of 0.3 ppm on aesthetic and taste considerations rather than physiological reasons. Two of the wells had iron concentrations exceeding the 0.3 ppm recommended limit.

Chloride (Cl) - was included in the survey because they may be derived from human sewage in addition to the natural mineral origin. Chlorides in water are generally not harmful to humans and restrictions on the concentrations are based on palatability requirements rather than health. The OWRC recommends that for a water supply the chloride concentration should not exceed 250 ppm. Only one of the samples approached this concentration and it is felt sewage played a large role in the apparent increase from the normal.

Nitrates (N)- usually occur in larger quantities in groundwater as a result of excessive application of fertilizer or leachings from septic tank systems. Cases of infant methamoglobinemia have been reported where nitrate concentrations were high in the drinking water. A limit of 10 ppm as N has been established by the OWRC. Four of the six samples had concentrations exceeding this limit and leaching from subsurface systems was felt to be the cause.

Phosphorus (P) - is of minor importance in the study of the groundwater supply.

Sulphates(SO4) - occur in natural waters as a result of leachings from gypsum or other common minerals. Sulphates cause permanent hardness in water and aid in the formation of scales. A limit of 250 ppm has been established mainly because of tne laxative action and although this limit was not exceeded in any of the samples, it is known sulphur exists in some wells within the village. This is especially true along the shores of the creek meandering through the village.

SOURCES OF CONTAMINATION

To evaluate the sources of contamination it was necessary to rely upon over-all assumptions based on spot check investigations. After reviewing the area, the following were attributed as being a direct cause of the adverse results.

1) Close proximity of septic tank systems or privies to the wells. Since the Village of Bloomfield can be classified as one of the older communities, the installation of subsurface systems were probably never properly supervised until the local health

unit was established in 1966. Therefore, many wells and septic tank systems are much closer than they should be. The fractured limestone bedrock that underlies the Bloomfield area certainly assists in the movement of contaminated groundwater.

Normally, it is customary to find many small parcels of land in the older communities of Ontario but this is not the general case in the Village of Bloomfield. There are however some wells, particularly those in the built up section of the village which are situated on small plots of land and the sewage disposal system for the premises are located on the same plots.

2) The construction of some of the older wells has started to deteriorate, thereby allowing the access of surface water into the groundwater supply. In this section the writer makes special reference to the sanitary hand pumps that are being used by several residents.

After the well survey, staff of the OWRC Water and Well Management Branch conducted a field investigation to determine whether faulty well construction was the cause of the groundwater contamination.

The wells exhibiting high total and fecal coliforms were reviewed and the conclusion was that the close proximity of septic tank systems to the water supply wells was the main contributor to the adverse results.

CORRECTIVE MEASURES

Groundwater is extremely vulnerable to contamination by the introduction of domestic wastes into subsurface leaching

systems which are in close proximity to wells. If the soil conditions and rock formations are also unfavourable of course the problem is magnified. In the Village of Bloomfield the soil conditions are generally conducive to the installation of subsurface systems and the lots are of sufficient size to accommodate both water and sewage facilities. In the past, perhaps not enough attention was given to the location of the wells especially when it related to the neighbours septic tank system. The main concern usually was to obtain a good quantity of water in the location selected by the local dowser.* Relocation of some septic tank systems is therefore suggested in order to evade the underground contamination.

It should be noted that only seven wells scattered throughout the village (no apparent pattern) had extremely high counts. Based on the investigation by the OWRC Water and Well Management Branch it appears that individual correction, and this means relocation of the septic tank systems as stated above, could alleviate many of the problems.

In addition, each property owner should seriously investigate his well to ensure that no surface drainage could infiltrate into the groundwater supply.

Batch chlorination to disinfect bacteria which may be thriving in the well is also suggested. Assistance and advice may be obtained from the local health unit.

WATER POLLUTION SURVEY AND RESULTS

Bacteriological and chemical samples were collected at six stations as shown in Appendix Three on April 15, 1971.

* one who searches for water with a divining rod.

According to the results, using the parameters of 5 Day BOD, suspended solids, total coliforms and fecal coliforms, no significant sources of pollution were detected. The phosphorus concentration was relatively low during the survey and based on the visual appearance of the creek, the quality appeared to be good.

At the time of the last survey in October 1965, the large cannery was encountering problems in holding all wastes in the waste stabilization pond. Consequently, process wastes were escaping to the creek beside the plant which of course had a grave effect on the quality of water. According to recent reports and checks by our Division of Industrial Wastes, the system is now trouble free. The results of this survey confirmed these reports.

MUNICIPAL SYSTEM

Recently, a Public Hearing was held under Section 46a of the Ontario Water Resources Commission Act to designate the County of Prince Edward as a Water & Sewage Service Area. Mr. Anderson stated at the meeting that the village was in favour of a Water & Sewer Area, however, the wells at present were adequate. During the survey, staff also noted that the public interest in a communal water supply was non existant. Therefore, based on these opinions and the results of the survey, it would appear that individual wells will be used by the residents for many years.

SUMMARY

A well and water pollution survey was conducted in

the Village of Bloomfield during the week of April 12, 1971.

The community can develop to a certain extent on individual services providing there is adequate separation between on-site wells and sewage disposal systems through requirements of larger lots.

A bacteriological examination of the wells revealed that 59% were satisfactory, 19% were doubtful and 22% were unsatisfactory. Relocation of some septic tank systems and ensuring that surface water does not infiltrate into the wells would greatly improve the situation.

It is concluded that the unnamed creek flowing through the village at the time of the investigation was free of pollution. The problem encountered by Baxter Canning Co. Ltd. in the past appeared to have been rectified.

There is no interest on the part of the residents of the village to construct a communal water supply system.

RECOMMENDATIONS

1) In view of the close proximity of some septic tank systems to private wells, it is recommended that these subsurface systems be relocated.
2) Where well pollution is indicated, the residents in the Village of Bloomfield should ensure that surface drainage does not enter their wells.
3) Biological activity may be flourishing in many of the wells classified as "doubtful". Batch chlorination and resampling of these wells is recommended.

4) The regulatory bodies will continue to ensure provisions are taken for the purpose of groundwater contamination control and the local land committee should also seriously review each land severance in an effort to prevent water and waste treatment facilities being constructed on small lots or where there is inadequate soil. The council should also use the same caution in the approval of building permits.

5) Since a heavy financial burden would be imposed on the residents if a municipal water system was installed and individual correction of the poor wells appears feasible, it is recommended that a municipal system not be considered at this time. The information, data and results presented in this report should however be digested for future use.

RAD/lc Report prepared by Robert A. Dunn

R. A. Dunn, P. Eng.,
Div. of Sanitary Engineering.

APPENDIX I

WATER QUALITY AND EFFLUENT OBJECTIVES

The OWRC objectives for surface waters is described in a booklet entitled "Guidelines and Criteria for Water Quality Management in Ontario". A copy of the booklet is enclosed in the pocket on the back cover of this report. This publication contains the guidelines and introduces water quality criteria for various uses including public, agricultural and industrial water supply, recreation, aesthetic enjoyment and the propagation of fish and wildlife. The guidelines should be followed to determine the acceptability of a watercourse for various uses.

A few pertinent maximum limits of contaminants in sewage treatment plant and industrial effluents are listed below. Adequate protection for surface waters except in certain specific instances influenced by local conditions, should be provided if the following concentrations are not exceeded:

5-Day BOD - not greater than 15 ppm
Suspended Solids - not greater than 15 ppm

GLOSSARY OF TERMS

Coliform Organisms - The Membrane Filter Technique is used to obtain a direct count of coliform organisms. These organisms are the normal inhabitants of the intestines of man and other warm-blooded animals and soils. They are always

present in large numbers in untreated sewage and are, in general, relatively few in number in other stream pollutants. The fecal portion of the total coliforms originate only in the intestines of man and warm-blooded animals and indicate recent pollution.

Biochemical Oxygen Demand (BOD) - The biochemical oxygen demand test indicates the amount of oxygen required for stabilization of the decomposable organic matter found in sewage, sewage effluent, polluted waters, or industrial wastes. This test is carried out at a temperature of 20^{o} C over a period of 5 days and the results are reported in parts per million (ppm).

Solids - The analyses for solids include tests for total, suspended and dissolved solids. The results are reported in parts per million (ppm). The total solids is a measure of the solids in solution and in suspension. Suspended solids indicate the measure of undissolved solids of organic or inorganic nature whereas the dissolved solids are a measure of those solids in solution. Land erosion, sewage and industrial wastes are significant sources of suspended solids.

REFERENCES

STANDARD METHODS for the Examination of Water and Wastewater. Twelfth Edition 1965.

SOIL SURVEY OF PRINCE EDWARD COUNTY- Richards,N.R. and Morwick,F.F. Dominion Department of Agriculture and the Ontario Agricultural College, Guelph 1948.

GROUNDWATER CONTAMINATION - U.S. Department of Health, Education and Welfare - Proceedings of 1961 Symposium

WATER POLLUTION SURVEY OF THE VILLAGE OF BLOOMFIELD - 1966.

APPENDIX ONE

Copy of Letter Sent to Municipality Outlining Date of Survey

March 23, 1971.

The Corporation of the
Village of Bloomfield,
Bloomfield, Ontario.

Attention: Mr. A. Anderson, Reeve

Dear Mr. Anderson:

Re: Village of Bloomfield
Private Well Survey

This letter is to advise your office that field staff of this Commission and your local health unit have made arrangements necessary to carry out a private well survey, door to door, in the Village of Bloomfield on April 13, 1971.

It would be appreciated if the residents of Bloomfield could be advised, through your offices, that the foregoing will take place. Your co-operation in this respect would be greatly appreciated and if there are any questions raised in the foregoing please do not hesitate to contact this office.

Yours very truly,

(signed) L. G. South, P. Eng.,
District Engineer,
Div. of Sanitary Engineering.

CLY/lc

APPENDIX TWO

Copy of letter to Residents in Village of Bloomfield Informing Them of Bacteriological Results

April 26, 1971.

Dear

Re: Private Well Supply

The result of the examination performed on the bacteriological sample taken from your drinking water supply during the week of April 12, 1971 indicated that it is unsatisfactory - doubtful. Therefore, in conjunction with Mr. H. Seeley, C.P.H.I.(C), Hastings & Prince Edward Counties Health Unit, 18 Elizabeth St., Picton-476-3472, we would suggest that the following be carried out to ensure that your water supply is safe for human consumption.

If the sample taken from your water supply was

a) unsatisfactory - we suggest that this water should not be used for drinking purposes without *treatment. The examination of the sample revealed the presence of faecal coliform organisms, which indicate contamination of your supply from an intestinal origin.

b) doubtful - we would suggest that this water should be *treated prior to human consumption until further bacteriological samples indicate that this water supply is safe for use. The examination of this sample revealed the presence of coliform organisms which may, or may not, indicate contamination of supply from an intestinal origin.

* Treatment of your supply should consist of either proper chlorination or boiling the water, at a full roll, for at least five (5) minutes prior to consumption.

Any questions raisedin the foregoing, assistance required with respect to the interpretation of this correspondence, or re-sampling of your water supply should be directed to Mr. H. Seeley of your local health unit or this office.

Yours very truly,

(signed) L. G. South, P. Eng.,
District Engineer,
Div. of Sanitary Engineering.

CLY/lc

APPENDIX THREE

VILLAGE OF BLOOMFIELD

CHEMICAL QUALITY OF PRIVATE WELLS

SAMPLE No.	HARDNESS as CaCO3	ALKALINITY as CaCO3	IRON as Fe	CHLORIDE as Cl	pH at Lab	NITROGEN AS N				PHOSPHORUS AS P		SULPHATE as SO4
						Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Total	Sol.	
I-2	270	218	0.05	25	7.5	<0.01	0.20	0.002	5.2	0.018	0.016	24
-5	536	320	<0.05	233	7.2	<0.01	0.19	0.004	15.0	0.012	0.010	36
I-22	320	260	0.40	25	7.4	0.02	0.13	0.020	3.0	0.014	0.003	51
-21	352	256	0.70	38	7.3	0.13	0.31	0.140	16.0	0.004	0.001	56
-1	388	302	0.10	105	7.4	<0.01	0.46	0.008	20.0	1.000	0.70	41
-20	412	278	<0.05	47	7.3	<0.01	0.18	0.040	19.0	0.004	0.004	57

I-2 Mr. T. Bevan, 31 Wellington St.

-5 Mr. Brushey, Wellington Rd.

I-22 Mrs. T. Dunlop, 38 Stanley St.

I-21 Mrs. E. Lauder, 62 Main St.

-1 Mr. C. Rumburgh, 54 Stanley St.

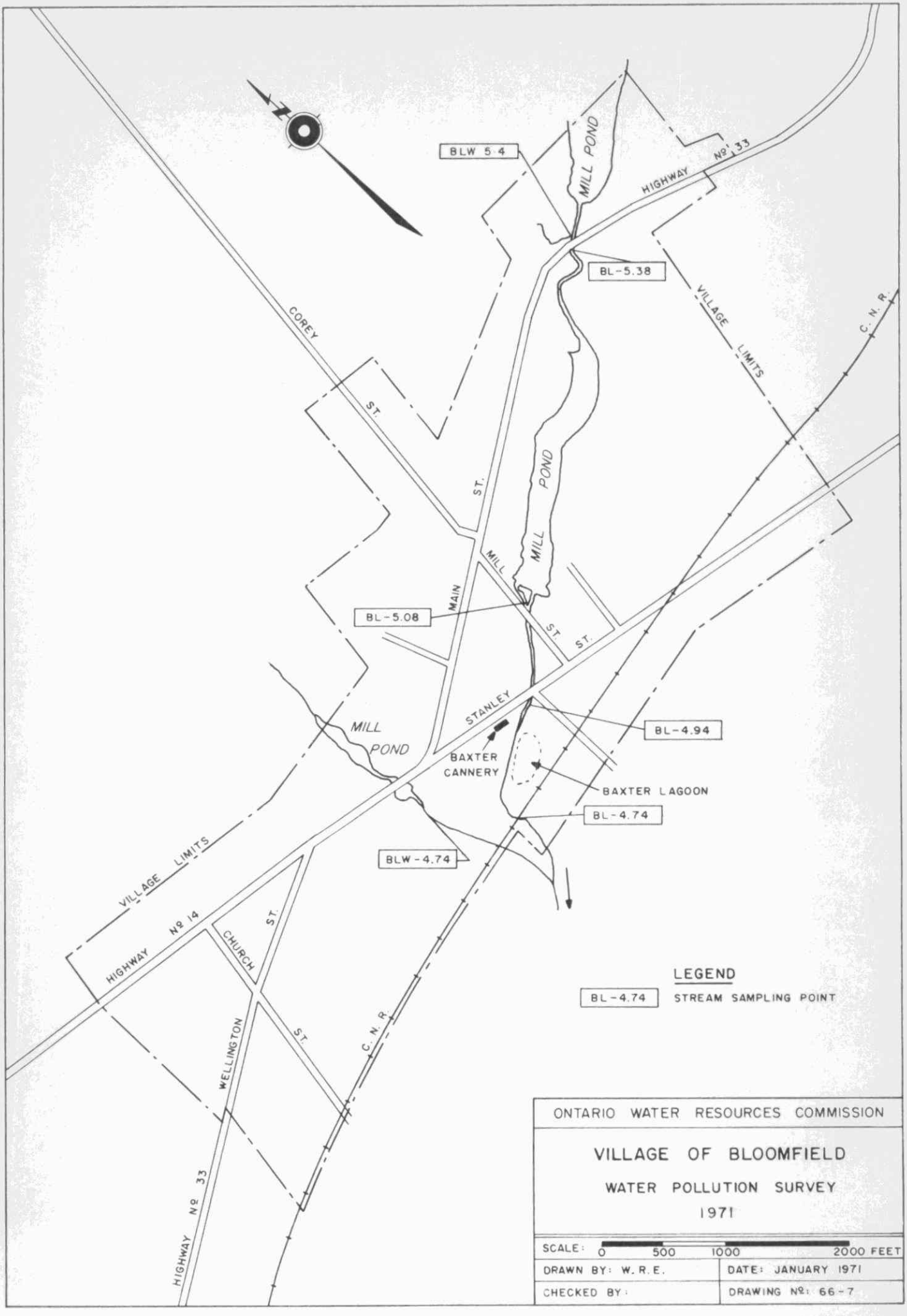
-20 Mr. L. S. Thomspon, 39 Main St.

APPENDIX FOUR

VILLAGE OF BLOOMFIELD

WATER POLLUTION SURVEY

Sample Point No.	Description	5 Day BOD	SOLIDS			NITROGEN AS N				PHOSPHORUS AS P		BACTERIOLOGICAL EXAMINATION per 100 ml.		
			Tot.	Susp.	Diss.	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Tot.	Sol.	Total Coli.	Fecal Coli.	Fecal Streptococcus
BLW-5.4	Drainage Course to Unnamed Creek at Hwy. # 33	1.4	340	5	335	.02	.28	.017	7.1	.064	.048	10	<10	<10
BL-5.38	Unnamed Creek at Hwy. # 33	0.6	260	5	255	<.01	.41	.010	2.8	.040	.012	160	60	<10
BL-5.08	Unnamed Creek at Mill St.	1.4	240	5	235	<.01	.37	.010	2.7	.016	.006	<10	<10	<10
BL-4.94	Unnamed Creek at Stanley St.	1.6	260	5	255	<.01	.34	.011	2.7	.016	.004	30	<10	<10
BLW-4.74	Tributary to Unnamed Creek South Stanley St.	1.4	260	5	255	<.01	.41	.010	2.0	.026	.013	1000	10	<10
BL-4.74	Unnamed Creek at CNR Tracks	0.6	250	5	245	<.01	.39	.011	2.4	.022	.005	40	<10	<10


BLW 5.4
MILL POND
HIGHWAY Nº 33
BL-5.38
VILLAGE LIMITS
C. N. R.
COREY ST.
ST.
MILL POND
MILL
MAIN ST.
BL-5.08
ST.
STANLEY
MILL POND
BL-4.94
BAXTER CANNERY
BAXTER LAGOON
BL-4.74
BLW-4.74
VILLAGE LIMITS
HIGHWAY Nº 14
CHURCH ST.
WELLINGTON ST.
C. N. R.
HIGHWAY Nº 33
LEGEND
BL-4.74
STREAM SAMPLING POINT
ONTARIO WATER RESOURCES COMMISSION
VILLAGE OF BLOOMFIELD
WATER POLLUTION SURVEY
1971
SCALE: 0 500 1000 2000 FEET
DRAWN BY: W. R. E.
DATE: JANUARY 1971
CHECKED BY:
DRAWING Nº: 66-7